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CONSERVATION OF ORCHIDS IN SIKKIM-HIMALAYAS, INDIA*

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Sikkim constitutes a mountainous terrain spread over 7298 sq km in the Eastern Himalaya and is quite well known for its resplendent floral and faunal aggregation. It is bounded in the north by Tibet, east by Tibet and Bhutan, south by West Bengal and west by Nepal. It lies between 27°5′ and 28°10′. North Latitude and 88°4′ & 88°58′ East Longitude. From north to south it measures 112 km in length and from east to west 64 km in breadth. In the south the land descends to 240 metres above sea level where the climate is sub-tropical while in the north it rises steeply to include the summit of Kanchanjunga (8585 m), the third highest mountain in the world.

Within a few kilometers the type of vegetation varies from tropical evergreen in the altitudes upto 1500 m temperate type upto 4000 m and alpine types from 4000 m to permanent snow line at 4900 m. The alpine zone is characterised by such flowers as primulas, gentians, blue poppies and Himalayan rhubarb.

Sikkim lies in the path of monsoon and its lower region experiences rain fall of 360 mm. However, the annual rain fall ranges between 1000 mm to 3000 mm per year. Normally the rainy season starts from April-May and continues till September and quite often goes beyond with one or two winter showers. Temperature varies to a great extent and the maximum temperature recorded is 20°C and the minimum is 12°C with the mercury dropping below 0°C during last week of December and first week of January followed by snow falls.

ORCHID WEALTH OF SIKKIM

Sikkim is the homeland of many interesting and beautiful orchids which are found within its myriad fold of valleys. The orchid species display a bewildering spectra of form, colour and designs which perhaps are hard to come by elsewhere in their diversity. It is the humidity, altitudinal variation and changing land-forms that have contributed to such cornucopial assemblage of orchids in the Sikkim Himalaya.

In geological parlance the Sikkim hills are generally referred to as the "great drainage basin of the river Tista". The composite block of this tiny Himalayan landscape harbours about 425 species under 95 genera, the important ones being *Acanthephippium* (2 spp.), *Bulbophyllum* (20 spp.), *Calanthe* (10 spp.), *Cymbidium* (9 spp.), *Dendrobium* (24 spp.), *Pleione* (4 spp.), *Phaleonopsis* (2 spp.) and many more. The legendary 'lost Orchid' *Paphiopedilum fairieanum*, is also found here. The highest elevation at which orchids are found in the Sikkim Himalaya is 4000 m , as exemplified by *Cypripediummacranthon.*

It is interesting to note that at certain locations, an entire tree might be clothed by the teeming mass of orchids. It is further fascinating to note that the first ever hybrid in the orchid world was made from the parent stock originating from this region.

The orchid species in Sikkim Himalaya display varied habits; some are saprophytes (eg. *Galeola* spp.) and some are climbers (eg. *Galeola lindleyana).* A species such as *Thrixspermum centipeda* produces its flower for a very short span of just 12 hours. Besides these, there is another interesting species that drives its flowering shoot into the soil, the flower buds also follow suit and

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bloom underground (this is known as "cleistogamy") as seen in the species *Cymbidium devoniaum*. We have another species that grows a full 3 m in height before flowering starts (eg. *Galeola falconeri*). The only parasitic orchid reported from Sikkim Himalaya, a total root parasite, is *Malaxis aphylla*. Throughout the year some or other orchids will be in bloom but the maximum species flower during February-April and October- December.

Statistical data showing species diversity in selected orchid genera in india and in Sikkim Himalaya.

Genera	No. of species reported from India	No. of species reported from Sikkim
1. *Acanthephippium*	3	2
2. *Aerides*	10	4
3.*Arachnis*	2	1
4. *Arundina*	1	1
5. *Bulbophyllum*	90	20
6. *Coelogyne*	39	12
7. *Cymbidium*	21	9
8. *Dendrobium*	90	24
9. *Eulophia*	35	6
10. *Liparis*	45	24
11. *Paphiopedilum*	9	1
12. *Pleione*	8	4
13. *Rhynchostylis*	1	1

STATUS OF CONSERVATION

It is now realised all over the world that several thousand species of both plants and animals are threatened and facing extinction. Many of them are critically rare and a few are already extinct. Studies in some parts of the world have proved that on an average about 10% of the plant species fall into one or the other category of threatened species and in order to protect them several conservation methods have been formulated from time to time. One of the common practice adopted is the establishment of National Parks, Sanctuaries and establishment of Belt Biosphere Conservation (BBC). The BBC method envisages the conservation of the virgin forests along the course of rivers on both banks in a continuous stretch. There is a serious and immediate need to establish sanctuaries at different altitudes with a view to protecting orchids in situ. These will also help in rehabilitating both terrestrial and epiphytic orchids which are being destroyed inadvertently through selective and random clearance of forests for various operations such as jhumming, wood collection and other developmental projects such as road, dam construction etc. The conservation programme should include prevantion of indiscriminate orchid collection from natural habitats for cultivation, studies and sale both within and outside a country. The code was presented by the conservation sub-committee to the International Orchid Commission (IOC) in March 1984. It was approved and is as follows:

i) The traders should be encourages to deal in nursery raised plants of species or orchids.

ii) The nursery raised orchid species must be indicated as such in a catalogue .

iii) The nurseries in orchid rich area must be encouraged to propagate species from seeds, through tissue culture techniques.

iv) They should resist the temptation to import jungle collected plants known to be endangered.

The International Union for Conservation of Nature (IUCN) has set up a number of specialist groups on plants under the auspices of Species Survival Commission (SSC) and the first meeting of Orchid Specialist Group was held during March 1985 which recommended the following objectives— (a) Conservation (b) Data collection (c) Research (d) Creation of Public awareness for the need of Orchid Conservation and (e) Development & promotion of conservation strategies.

Thus in order to maintain the diversity of Sikkim Orchids, sanctuaries at various altitudinal zones, Orchidarium or repository of any kind which can house all the available Sikkim Orchids need to be established. Keeping this in view the Forest Department of Govt. of Sikkim has

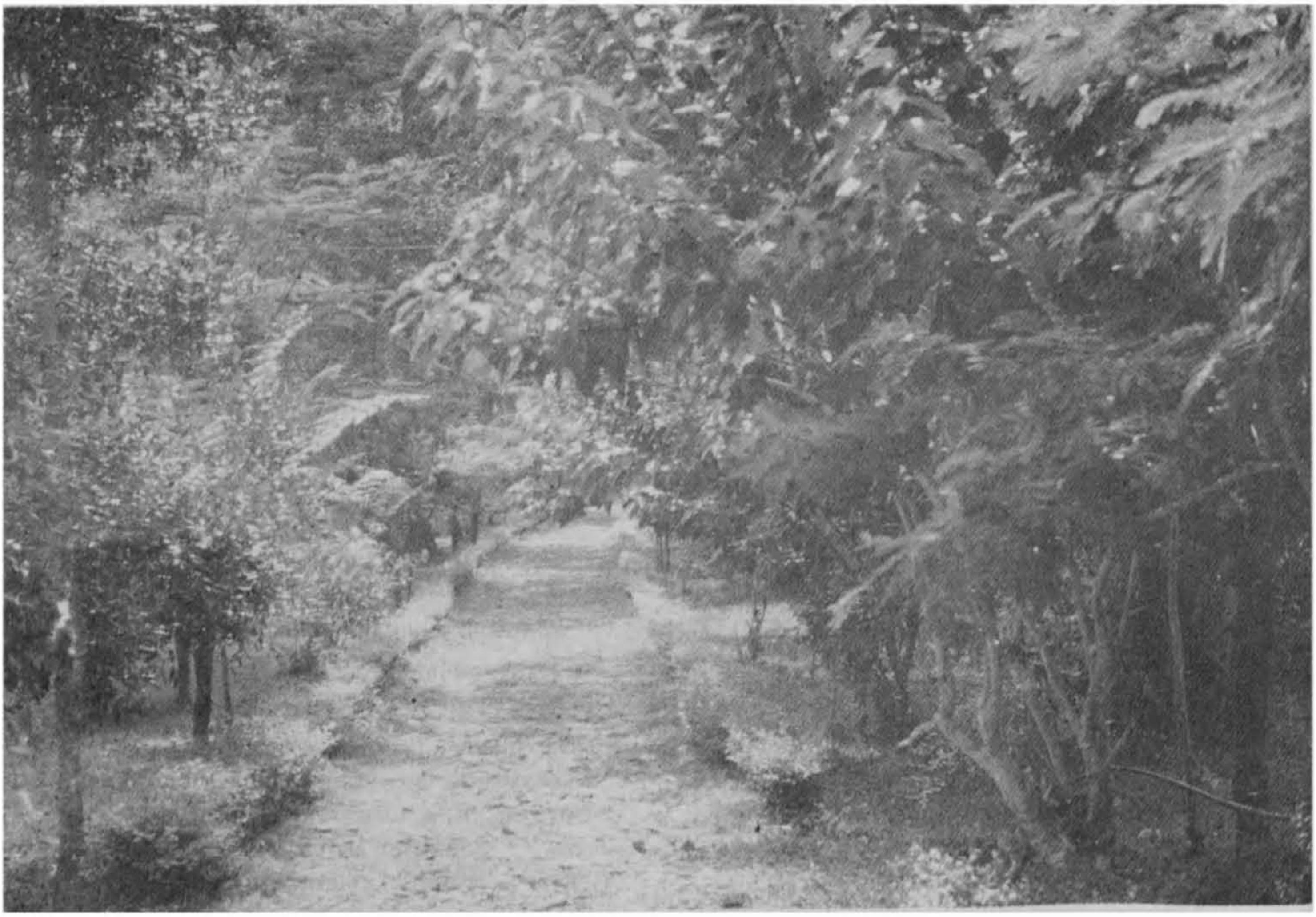

Fig.1 : Saramsa Orchid Sanctuary

established two Orchid Sanctuaries namely Deorali Orchid Sanctuary and Saramsa Orchid Sanctuary where many orchids are being conserved. But still there is a need to cultivate and propagate many more for germ plasm.

Fortunately the problem has received much publicity and considerable action has taken place in recent years to protect orchids from many threats that are endangering their continued existence. The control of pollution, establishment of nature reserves and national & international legislation to control picking, uprooting and trade, as well as wide publicity about their sad plight are some of the steps taken in the right direction. The world would be an immeasurably poorer place if there were no orchids.

Following is the list of some selected genera and species reported in Sikkim and conserved in Deorali and Saramsa Orchid Sanctuaries of Sikkim.

Genera		Sikkim		Deorali and Saramsa Orchid Sanctuaries	Performance
1. *Agrostophyllum*	4	*Agrostophyllum brevipes*	4	*Agrostophyllum brevipes*	Excellent
		A. callosum		*A. callosum*	Good
		A. khasianum		*A. khasianum*	Good
		A. myrianthum		*A. myrianthum*	Fair
2. *Anoectochilus*	7	*Anoectochilus brevilabris*	3	*Anoectochilus grandiflorus*	Fair
		A. clarkei		*A. lanceolatus*	Good
		A. crispus		*A. sikkimensis*	Good
		A. elwesii			
		A. grandiflorus			
		A. lanceolatus			
		A. sikkimensis			
3. *Anthogonium*	1	*Anthogonium gracile*	1	*Anthogonium gracile*	Good
4. *Aphyllorchis*	3	*Aphyllorchis alpina*	1	*Aphyllorchis alpina*	Fair
		A. montana .			
		A. parviflora			
5. *Arachnis*	1	*Arachnis cathcartii*	1	*Arachnis cathcartii*	Excellent
6. *Ascocentrum*	1	*Ascocentrum ampullaceum*	1	*Ascocentrum ampullaceum*	Excellent
7. *Bulbophyllum*	20	*Bulbophyllum affine*	13	*Bulbophyllum affine*	Good
		B. cauliflorum		*B. cauliflorum*	Good
		B. crassipes		*B. cylindraceum*	Good
		B. cylindraceum		*B. ebulbum*	Fair
		B. ebulbum		*B. eublepharum*	Good
		B. eublepharum		*B. guttulatum*	Good
		B. guttulatum		*B. hirtum*	Good
		B. helenae		*B. kingii*	Good
		B. hirtum		*B. odoratissimum*	Excellent
		B. khasianum		*B. piluliferum*	Good
		B. kingii		*B. rigidum*	Fair
		B. odoratissimum		*B. sikkimensis*	Good
		B. ornatissimum		*B. thomsoni*	Good
		B. piluliferum			
		B. retusiusculum			
		B. rigidum			
		B. sikkimensis			
		B. thomsoni			
		B. viridiflorum			
		B. yoksunense			

Genera		Sikkim		Deorali and Saramsa Orchid Sanctuaries	Performance
8. *Calanthe*	10	*Calanthe alismaefolia*	7	*Calanthe alpina*	Very Good
		C. alpina		*C. biloba*	Excellent
		C. biloba		*C. brevicornu*	Good
		C. brevicornu		*C. mannii*	Fair
		C. chloroleuca		*C. masuca*	Excellent
		C. manni		*C. uncata*	Fair
		C. masuca		*C. whiteana*	Fair
		C. trulliformis			
		C. uncata			
		C. whiteana			
9. *Camarotis*	1	*Camarotis mannii*	1	*Camarotis mannii*	Very Good
10. *Chiloschista*	2	*Chiloschista lunifera*	1	*Chiloschista lunifera*	Good
		C. usneoides			
11. *Cleisocentron*	1	*Cleisocentron trichromum*	1	*Cleisocentron trichromum*	Excellent
12. *Coelogyne*	12	*Coelogyne corymbosa*	9	*Coelogyne corymbosa*	Very Good
		C. cristata		*C. cristata*	Good
		C. flaccida		*C. flaccida*	Good
		C. fuscescens		*C. fuscescens*	Good
		C. longipes		*C. longipes*	Fair
		C. nitida		*C. nitida*	Good
		C. occultata		*C. occultata*	Good
		C. odoratissima		*C. odoratissima*	Fair
		C. ovalis		*C. ovalis*	Good
		C. prolifera			
		C. treutleri			
		C. uniflora			
13. *Cryptochilus*	2	*Cryptochilus lutea*	2	*Cryptochilus lutea*	Excellent
		C. sanguineus		*C. sanguineus*	Good
14. *Cymbidium*	9	*Cymbidium cochleare*	8	*Cymbidium cochleare*	Excellent
		C. devonianum		*C. devonianum*	Good
		C. eburneum		*C. eburneum*	Good
		C. ensifolium		*C. ensifolium*	Good
		C. gammieanum		*C. hookerianum*	Good
		C. hookerianum		*C. longifolium*	Good
		C. longifolium		*C. sikkimense*	Good
		C. sikkimense		*C. whiteae*	Good
		C. whiteae			
15. *Dendrobium*	24	*Dendrobium aduncum*	29	*Dendrobium aduncum*	Excellent
		D. anceps		*D. anceps*	Good
		D. aphyllum		*D. bicameratum*	Fair
		D. bicameratum		*D. candidum*	Fair
		D. candidum		*D. cathcartii*	Good
		D. cathcartii		*D. crysanthum*	Good
		D. chrysanthum		*D. chrysotoxum*	Good
		D. crystallinum		*D. crepidatum*	Good
		D. cumulatum		*D. cumulatum*	Good
		D. eriaeflorum		*D. densiflorum*	Excellent
		D. fimbriatum		*D. denudans*	Good
		var. *oculata*		*D. devonianum*	Good
		D. gibsonii		*D. eriaeflorum*	Good
		D. hookerianum		*D. falconeri*	Good

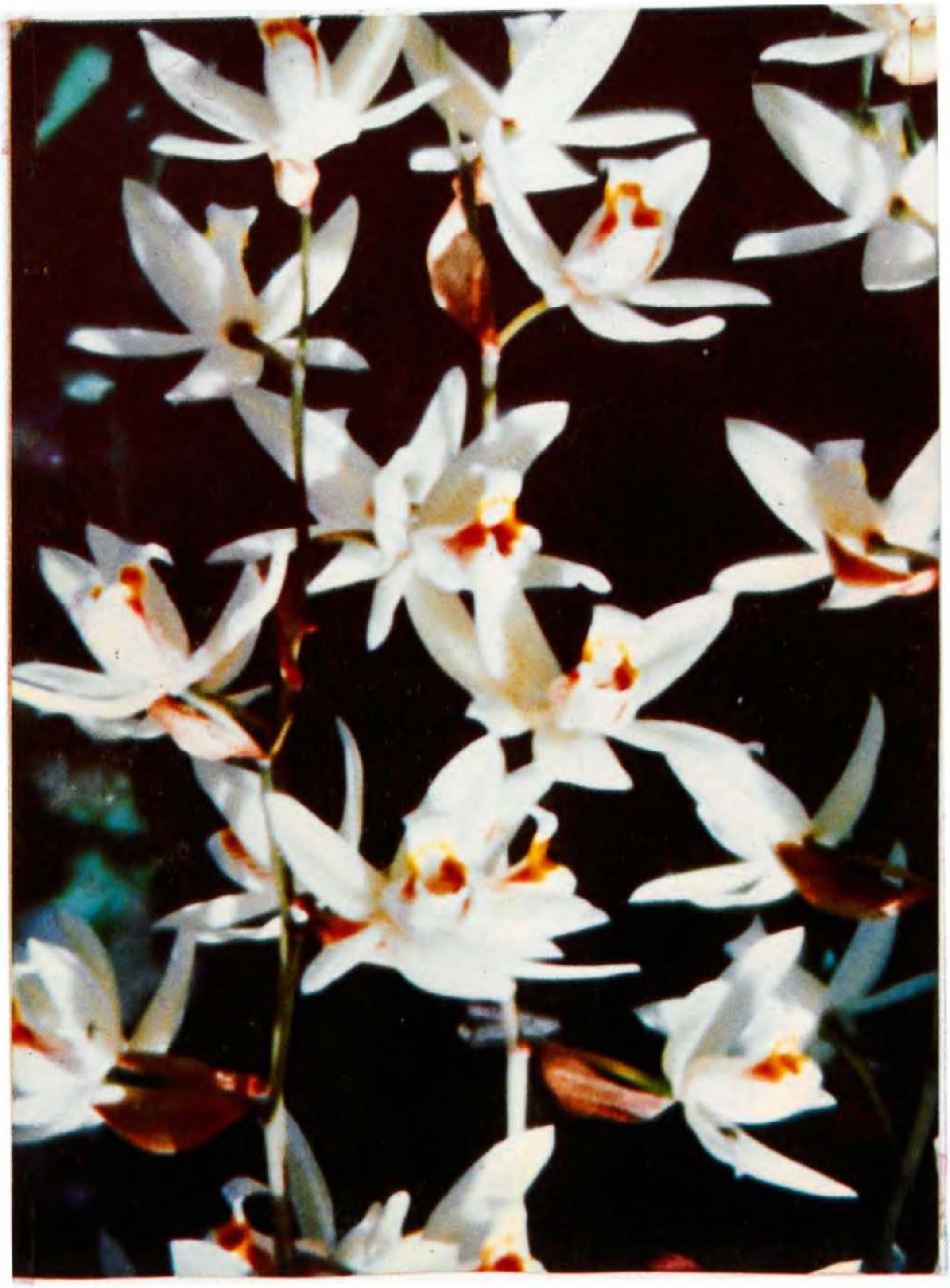

Fig 2 *Coelogyne flaccida* Lindl

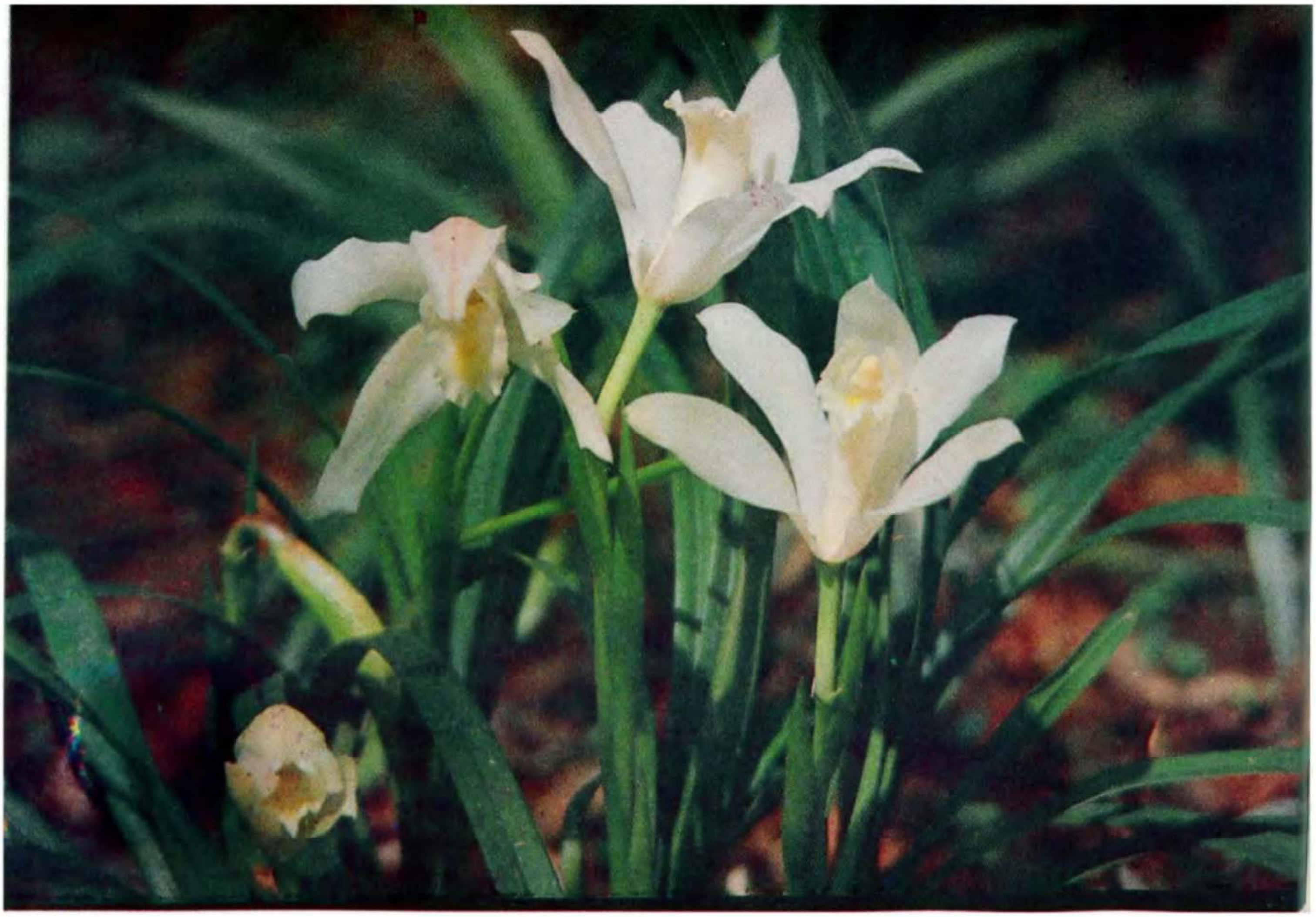

Fig. 3 : *Cymbidium eburneum* Lindl.

Genera		Sikkim		Deorali and Saramsa Orchid Sanctuaries	Performance
15. *Dendrobium* (contd.)		*D. longicornu*		*D. farmeri*	Good
		D. nobile		*D. fimbriatum* var. *fimbriatum*	Good
		D. palpebrae		*D. fimbriatum* var. *oculata*	Good
		D. pauciflorum		*D. formosum*	Good
		D. peguanum		*D. gibsonii*	Good
		D. porphyrochilum		*D. heterocarpum*	Fair
		D. primulinum		*D. hookerianum*	Good
		D. pulchellum		*D. longicornu*	Fair
		D. sulcatum		*D. moschatum*	Good
		D. terminale		*D. nobile*	Very Good
		D. transparens		*D. pauciflorum*	Good
				D. primulinum	Good
				D. sulcatum	Fair
				D. terminale	Fair
				D. transparens	Good
16. *Didiciea*	1	*Didiciea cunninghami*	1	*Didiciea cunninghami*	Very Good
17. *Epigeneium*	2	*Epigeneium fuscescens*	1	*Epigeneium fuscescens*	Fair
		E. rotundatum			
18. *Eria*	15	*Eria acervata*	11	*Eria acervata*	Good
		E. alba		*E. alba*	Good
		E. amica		*E. bambusifolia*	Good
		E. bambusifolia		*E. carinata*	Good
		E. biflora		*E. clausa*	Fair
		E. carinata		*E. coronaria*	Good
		E. clausa		*E. excavata*	Good
		E. coronaria		*E. graminifolia*	Good
		E. excavata		*E. paniculata*	Good
		E. graminifolia		*E. pannea*	Good
		E. paniculata		*E. stricta*	Fair
		E. pannea			
		E. scabrilinguis			
		E. stricta			
		E. vittata			
19. *Gastrochilus*	5	*Gastrochilus acutifolius*	2	*Gastrochilus calceolaris*	Fair
		G. affinis		*G. dasypogon*	Good
		G. calceolaris			
		G. dasypogon			
		G. distichus			
20. *Goodyera*	6	*Goodyera foliosa*	3	*Goodyera fusca*	Good
		G. fusca		*G. grandis*	Fair
		G. grandis		*G. procera*	Good
		G. procera			
		G. repens			
		G vittata			
21. *Habenaria*	11	*Habenaria albomarginata*	3	*Habenaria albomarginata*	Fair
		H. intermedia		*H. pachycaulon*	Good
		H. josephi		*H. plantaginea*	Good
		H. malleifera			
		H. nematocaulon			
		H. pachycaulon			
		H. pectinata			
		H. plantaginea			

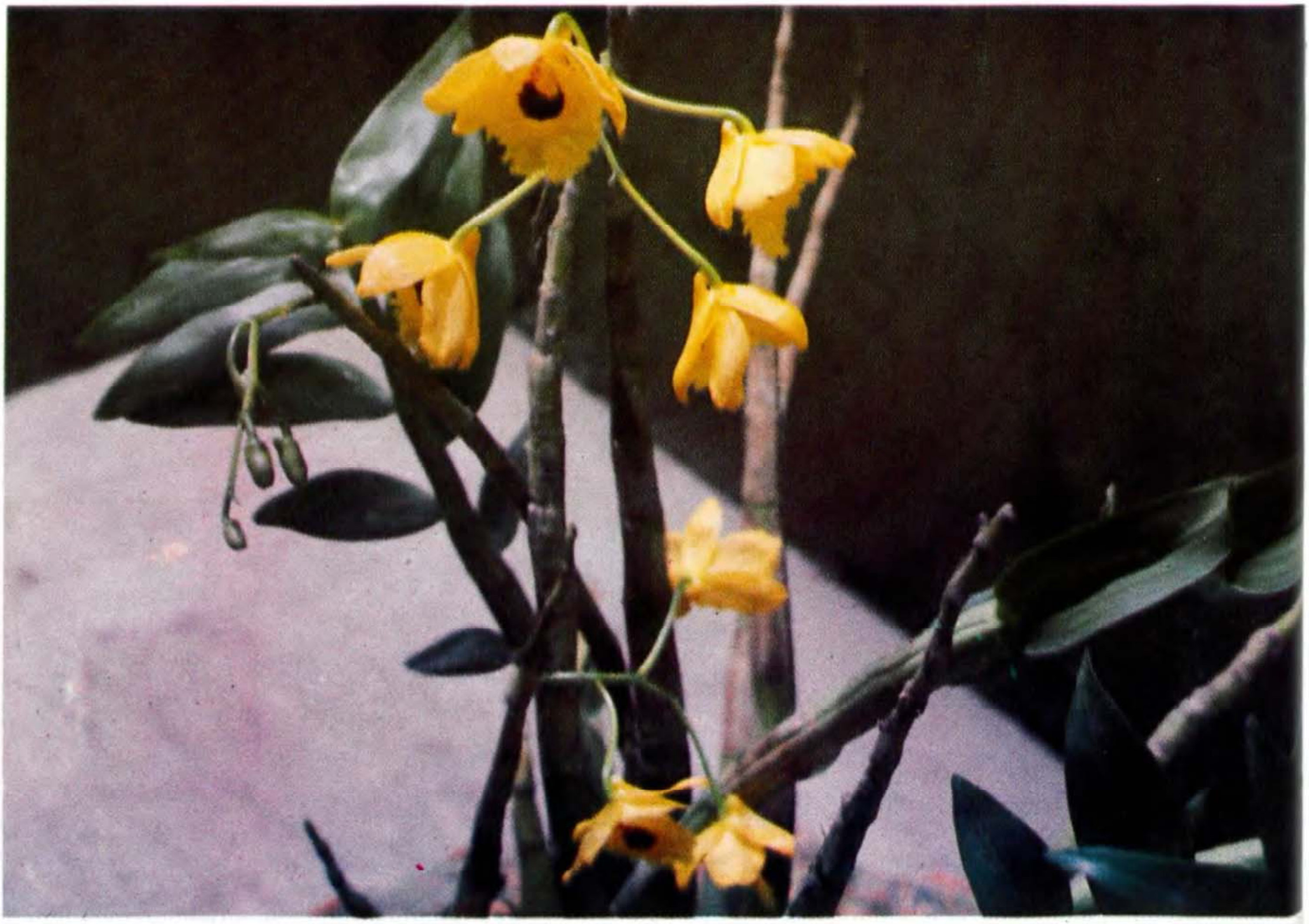

Fig. 4 *Dendrobium moschatum* (Buch.-Ham.) Swartz

Genera		Sikkim		Deorali and Saramsa Orchid Sanctuaries	Performance
21. *Habenaria (contd.)*		*H. polytricha*			
		H. reflexa			
		H. stenopetala			
22. *Herminium*	6	*Herminium josephi*	1	*Herminium orbiculare*	Fair
		H. lanceum			
		H. macrophyllum			
		H. monorchis			
		H. orbiculare			
		H. pugioniforme			
23. *Luisia*	3	*Luisia brachystachys*	2	*Luisia brachystachys*	Good
		L. volucris		*L. volucris*	Fair
		L. zeylanica			
24. *Malaxis*	4	*Malaxis acuminata*	3	*Malaxis aphylla*	Very Good
		M. aphylla		*M. cylindrostachya*	Fair
		M. cylindrostachya		*M. josephiana*	Fair
		M. josephiana			
25. *Neogyna*	1	*Neogyna gardneriana*	1	*Neogyna gardneriana*	Excellent
26. *Oberonia*	10	*Oberonia acaulis*	8	*Oberonia acaulis*	Very Good
		O. auriculata		*O. auriculata*	Good
		O. brachystachya		*O. emarginata*	Good
		O. emarginata		*O. ensiformis*	Good
		O. ensiformis		*O. obcordata*	Good
		O. lobulata		*O. orbicularis*	Fair
		O. obcordata		*O. pachyphylla*	Fair
		O. orbicularis		*O. recurva*	Fair
		O. pachyphylla			
		O. recurva			
27. *Ornithochilus*	1	*Ornithochilus difformis*	1	*Ornithochilus difformis*	Excellent
28. *Otochilus*	2	*Otochilus fuscus*	2	*Otochilus fuscus*	Excellent
		O. porrecta		*O. porrecta*	Good
29. *Paphiopedilum*	1	*Paphiopedilum venustum*	6.	*Paphiopedilum fairieanum*	Excellent
				P. hirsutissimum	Excellent
				P. insigne	Excellent
				P. spicerianum	Excellent
				P. venustum	Excellent
				P. villosum	Excellent
30. *Papilionanthe*	3	*Papilionanthe teres*	3	*Papilionanthe teres*	Excellent
		P. uniflora		*P. uniflora*	Good
		P. vandarum		*P. vandarum*	Good
31. *Peristylus*	5	*Peristylus affinis*	2	*Peristylus densus*	Fair
		P. densus		*P. goodyeroides*	Fair
		P. fallax			
		P. goodyeroides			
		P. hamiltonianus			
32. *Phaius*	3	*Phaius flavus*	3	*Phaius flavus*	Excellent
		P. mishmensis		*P. mishmensis*	Very Good
		P. tancarvilleae		*P. tancarvilleae*	Excellent
33. *Phalaenopsis*	2	*Phaleonopsis mannii*	2	*Phalaenopsis mannii*	Good
		P. parishii		*P. parishii*	Good

Genera		Sikkim		Deorali and Saramsa Orchid Sanctuaries	Performance
34. *Pholidota*	5	*Pholidota articulata*	4	*Pholidota articulata*	Very Good
		P. griffithii		*P. protracta*	Good
		P. protracta		*P. recurva*	Good
		P. recurva		*P. undulata*	Fair
		P. undulata			
35. *Pleione*	4	*Pleione hookeriana*	4	*Pleione hookeriana*	Excellent
		P. humilis		*P. humilis*	Good
		P. maculata		*P. maculata*	Excellent
		P. praecox		*P. praecox*	Excellent
36. *Satyrium*	1	*Satyrium nepalense*	1	*Satyrium nepalense*	Excellent
37. *Thunia*	1	*Thunia alba*	1	*Thunia alba*	Excellent

Endemism and Phenology in some Orchid Genera in Sikkim

The degree of endemism in a flora indicates the bio-geography of its flora, its relative isolation in the past, vicariance and adaptive evolution. The distribution of endemics may also give important clue to the processes of geologic and climatic events which happened in the past. The important parameters for the spread or contraction of endemics are geographic, climatic, adaphic factors and biotic causes. The Himalayan mountain chains encompassing at least a dozen highest peaks of the world of more 8340 m high girdling on the Southern and Western flanks of the highest table land Tibet, having the highest watershed of great rivers with numerous folds and valleys and having different climatic regimes from dry zone to wet monsoon is considered a nursery for adaptive evolution and speciation.

In all about 105 species are reported to be endemic to Sikkim Himalaya.

The undermentioned chart shows aspects related to endemism and phenology in some selected genera and species in Sikkim.

Genera	No. of species in India	No. of species in Sikkim	No. of endemics in Sikkim		Flowering period
1. *Amitostigma*	1	1	1	*Amitostigma puberulum*	June-July
2. *Biermannia*	2	1	1	*Biermannia bimaculata*	July
3. *Bulbophyllum*	90	20	3	*Bulbophyllum piluliferum* *B. rigidum* *B. thomsoni*	Aug.-Sep.
4. *Calanthe*	23	10	2	*Calanthe alpina* *C. uncata*	July-Aug.
5. *Camarotis*	2	1	1	*Camarotis mannii*	June-July
6. *Coelogyne*	39	12	1	*Coelogyne treutleri*	June-July
7. *Cymbidium*	21	9	2	*Cymbidium sikkimense* *C. whiteae*	Nov.- Dec.
8. *Dendrobium*	90	24	1	*Dendrobium cathcartii*	April-May
9. *Diglyphosa*	1	1	1	*Diglyphosa macrophylla*	April-May
10. *Eria*	50	12	1	*Eria graminifolia*	April-June
11. *Eulophia*	35	4	1	*Eulophia macrorhizon*	June-July

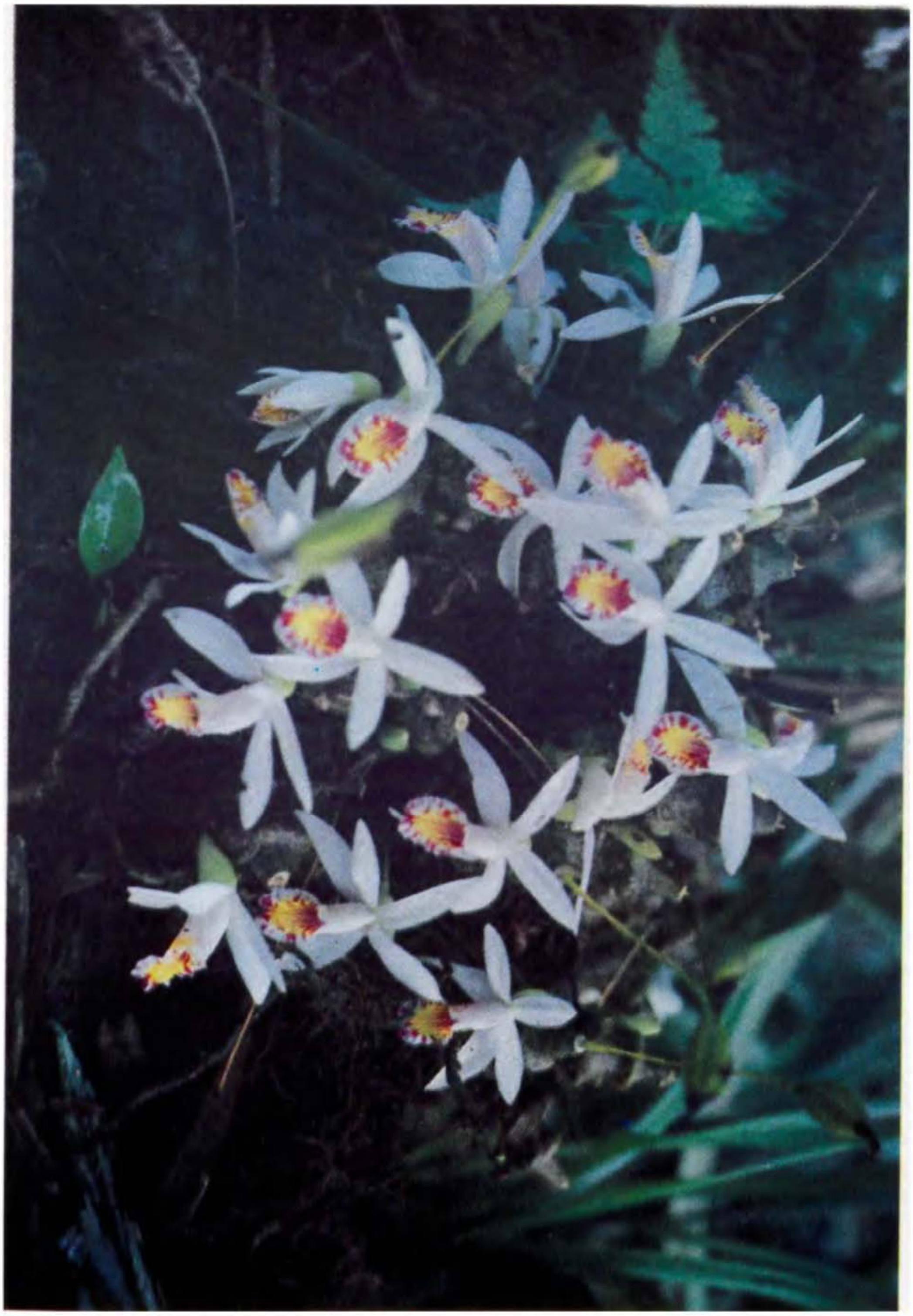

Fig. 5 : *Pleione maculata* Lindl.

Genera	No. of species in India	No. of species in Sikkim	No. of endemics in Sikkim		Flowering period
12. *Galeola*	6	3	1	*Galeola cathcartii*	July
13. *Goodyera*	17	3	1	*Goodyera grandis*	March
14. *Habenaria*	65	10	2	*Habenaria albomarginata* *H. camminsiana*	June-Aug.
15. *Liparis*	45	24	3	*Liparis gamblei* *L. platyrachis* *L. pygmaea*	July-Aug.
16. *Listera*	10	5	1	*Listera dentata*	July-Aug.
17. *Malaxis*	14	4	1	*Malaxis aphylla*	June
18. *Neottia*	3	1	1	*Neottia listeroides*	July
19. *Nephelaphyllum*	3	2	1	*Nephelaphyllum grandiflorum*	May
20. *Oberonia*	51	10	3	*Oberonia auriculata* *O. lobulata* *O. orbicularis*	Oct.-Nov.
21. *Risleya*	1	1	1	*Risleya atropurpurea*	July-Aug.
22. *Thrixspermum*	9	2	1	*Thrixspermum pygmaeum*	July

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